A CASE HISTORY (SO FAR)

New Bedford Harbor Superfund Site

NEW BEDFORD, MASSACHUSETTS

US Army Corps of Engineers
New England District

Presentation By: Rosemary Schmidt, Geologist

Interdisciplinary Team

project manager

wetlands experts archaeologists

biologists chemists geologists

engineers: geotechnical structural civil

construction cost specifications

hydraulics chemical GIS survey

health & safety real estate contracting

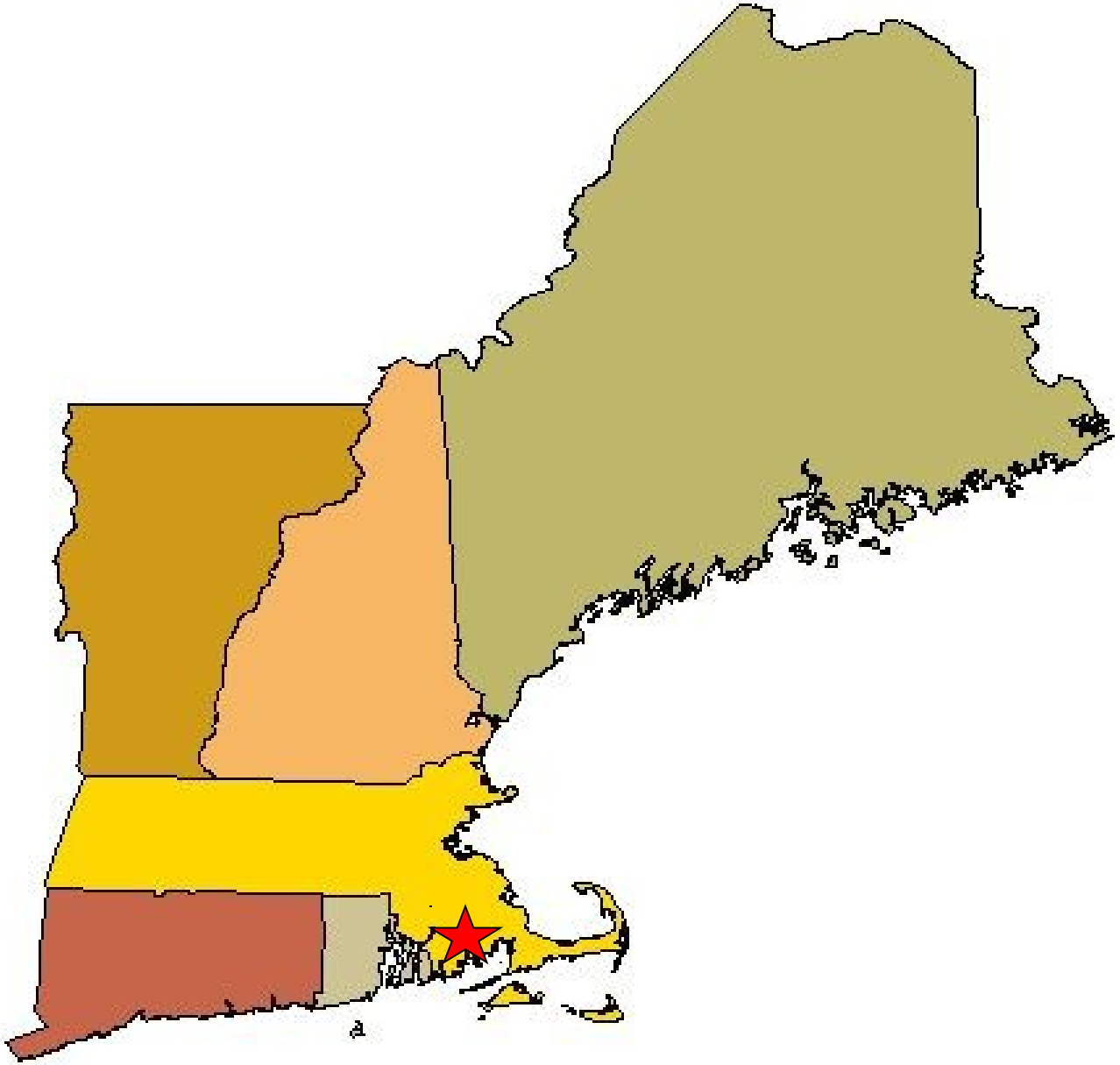
WES: seismicity mechanical dewatering

groundwater modeling

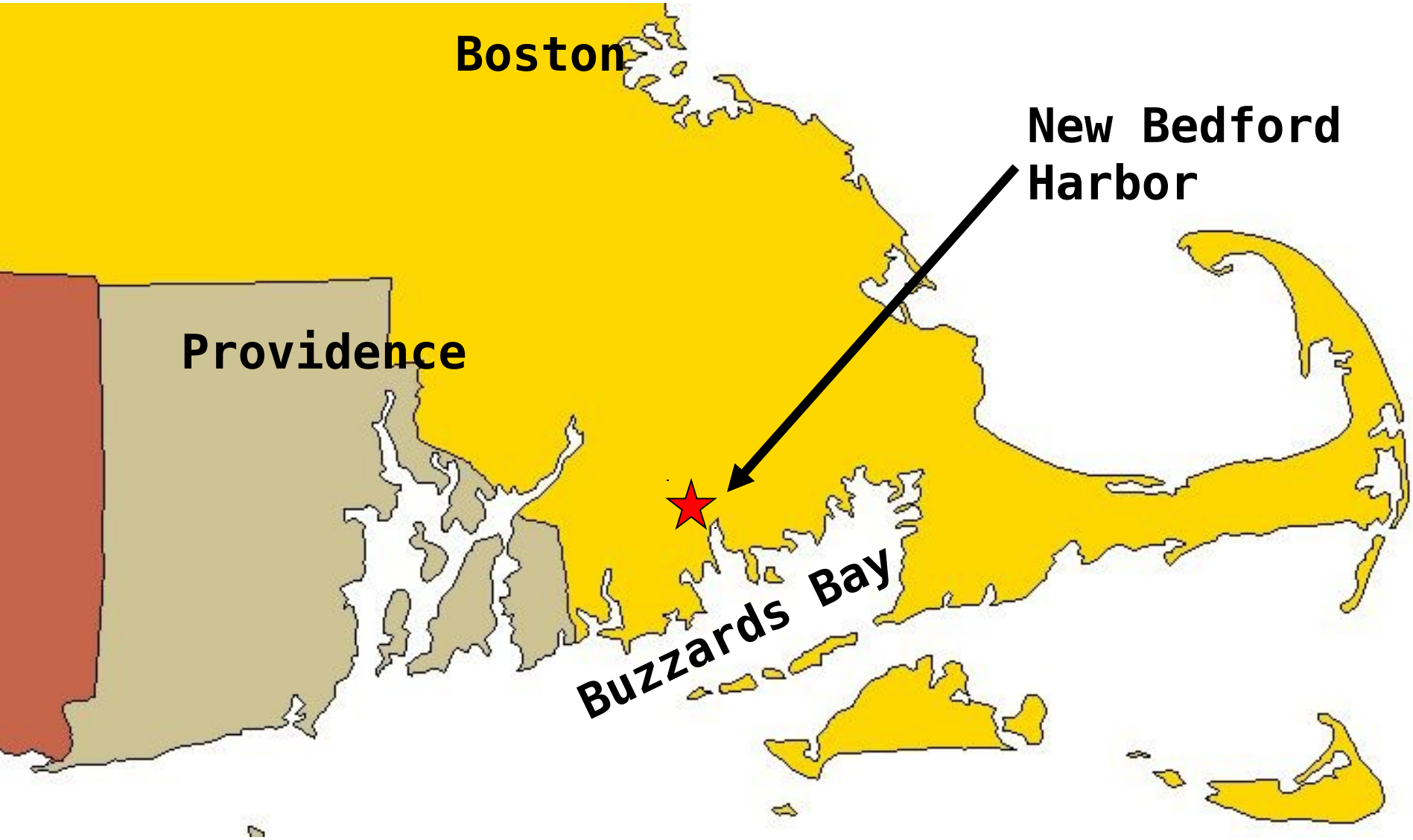
Overview

- History
- Remedy Design Paradigms
  - Confined Disposal Facilities (CDFs)
  - Dredging Plan
- Habitat Restoration
- Environmental Monitoring
- Lessons

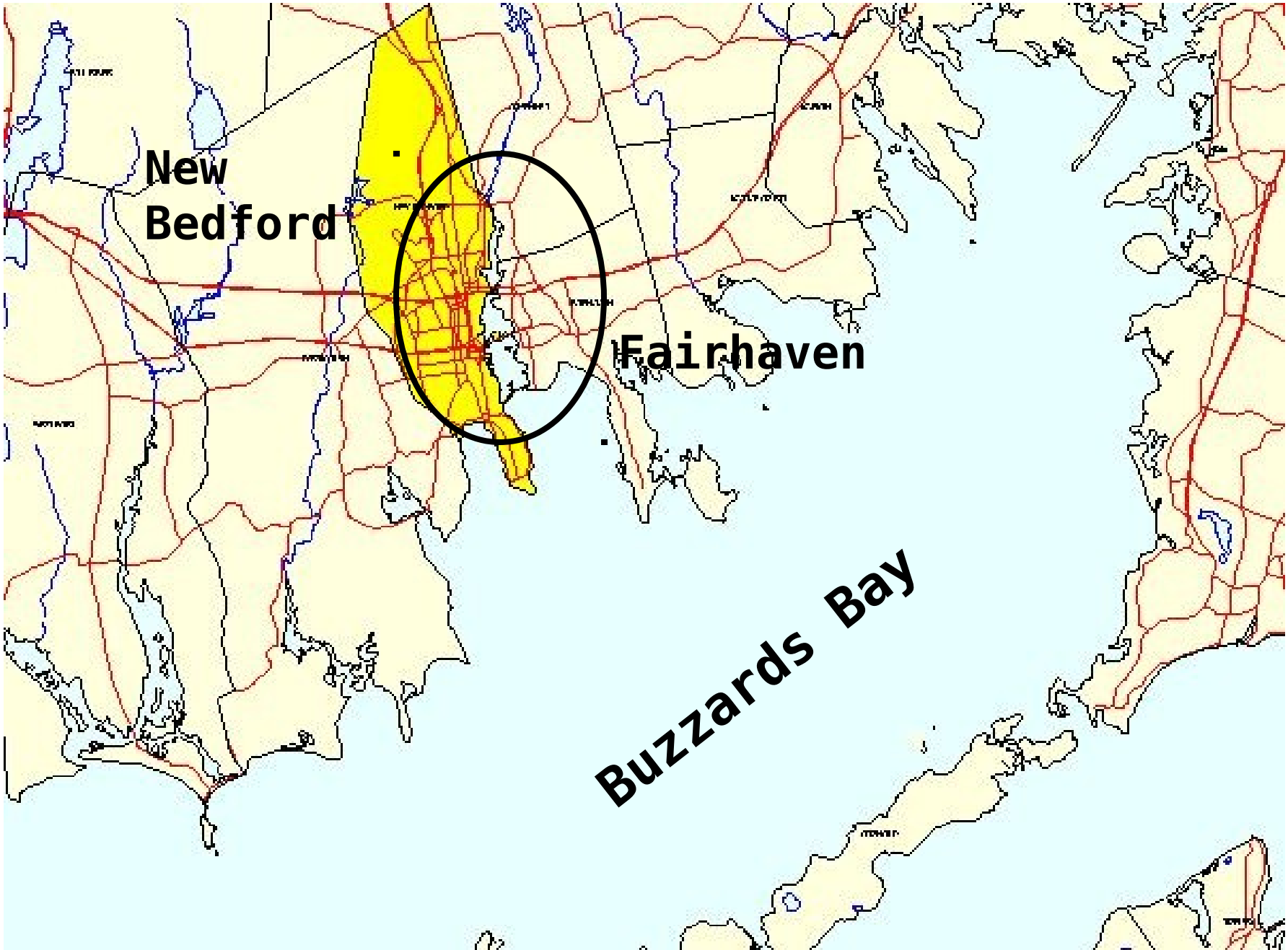
New England



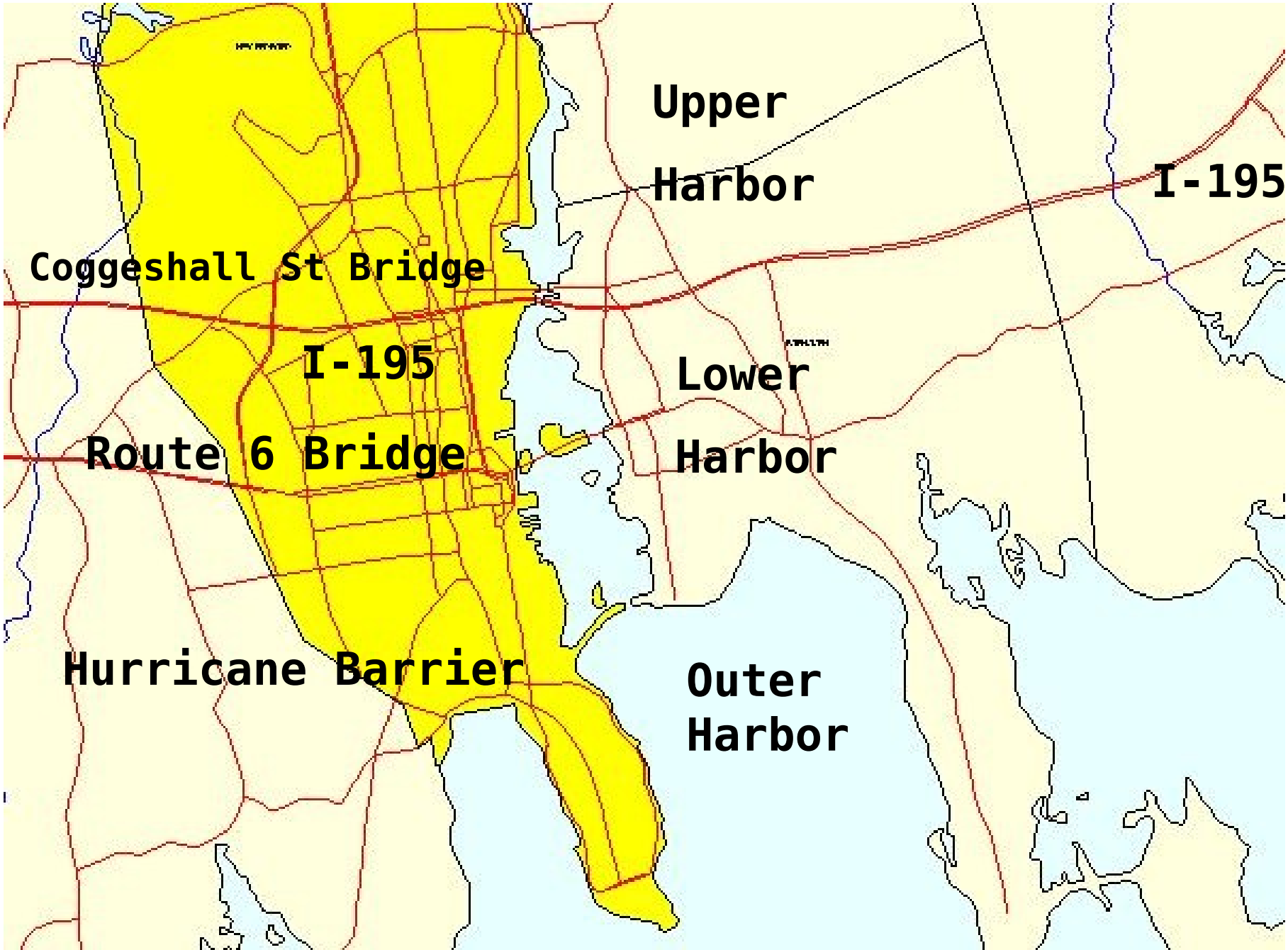
Southeast Massachusetts



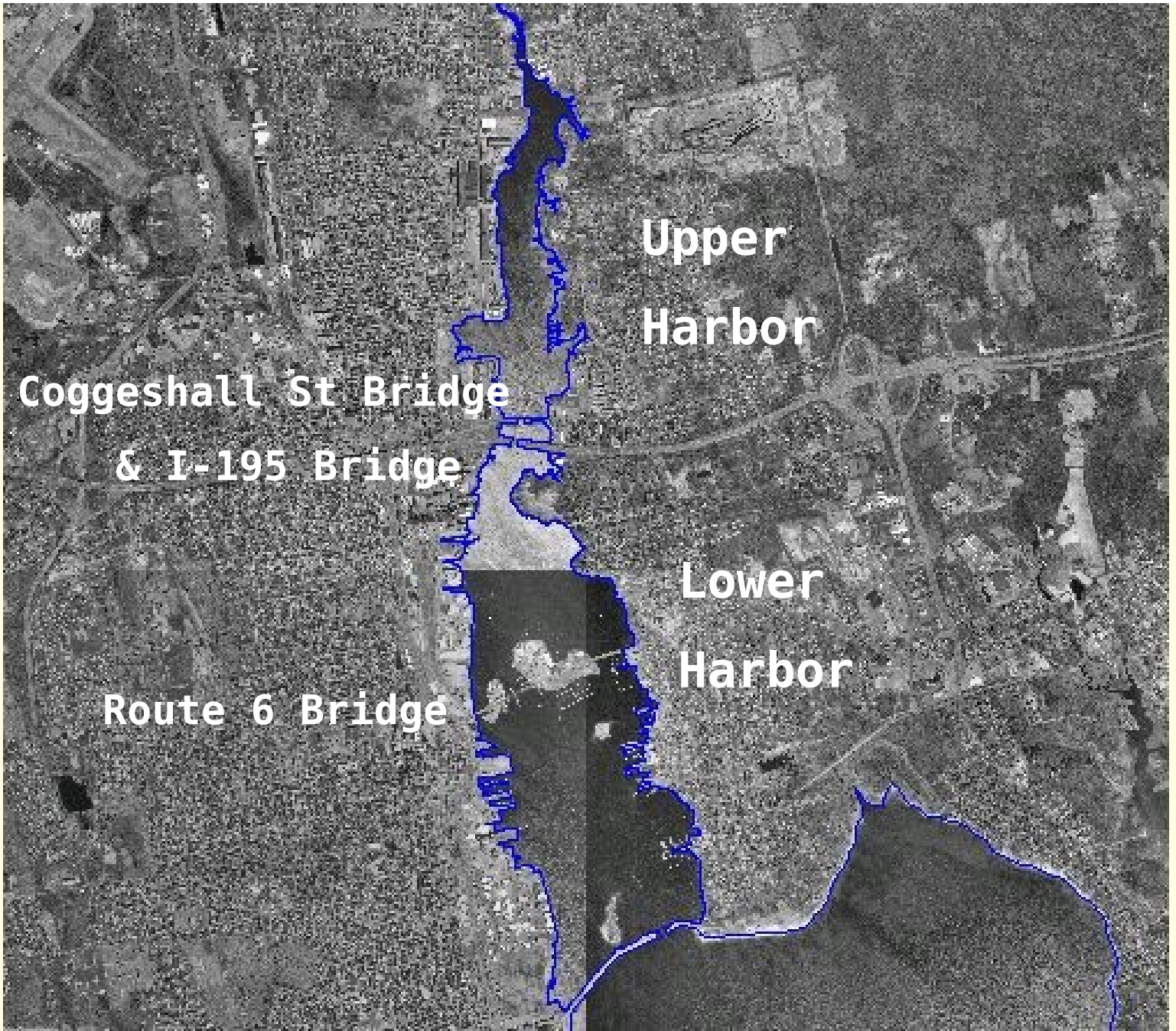
Buzzards Bay



New Bedford Harbor



New Bedford Harbor



New Bedford Harbor

History

- Cultural
- Navigation
- Superfund

History - Cultural

- Wampanoags - native inhabitants
- Whaling
  - Began 1760s
  - 1820 Nation's Top Whaling Port
  - 1857 Petroleum discovered, whaling declined
- Mills
  - 1846 Wamsutta Mill opened
  - 1930s Mills moved south
- Commercial Fishing 1800s - Today
- Other Industries . . .
  - Electrical Capacitor Plants 1940s - 1970s

1893
Acushnet
Acushnet Station
Turners Mills
Belleville
Great Cedar Swamp
ALL RIVER AND NEW BEDFORD RAILROAD
Rockdale
New Bedford
Cannonville
Station
Oxford
Ropes Id.
Crow Id.
Fairhaven
NEW BEDFORD HARBOR
Palmer Id.
Fort Point
Brook
FAIR HAVEN

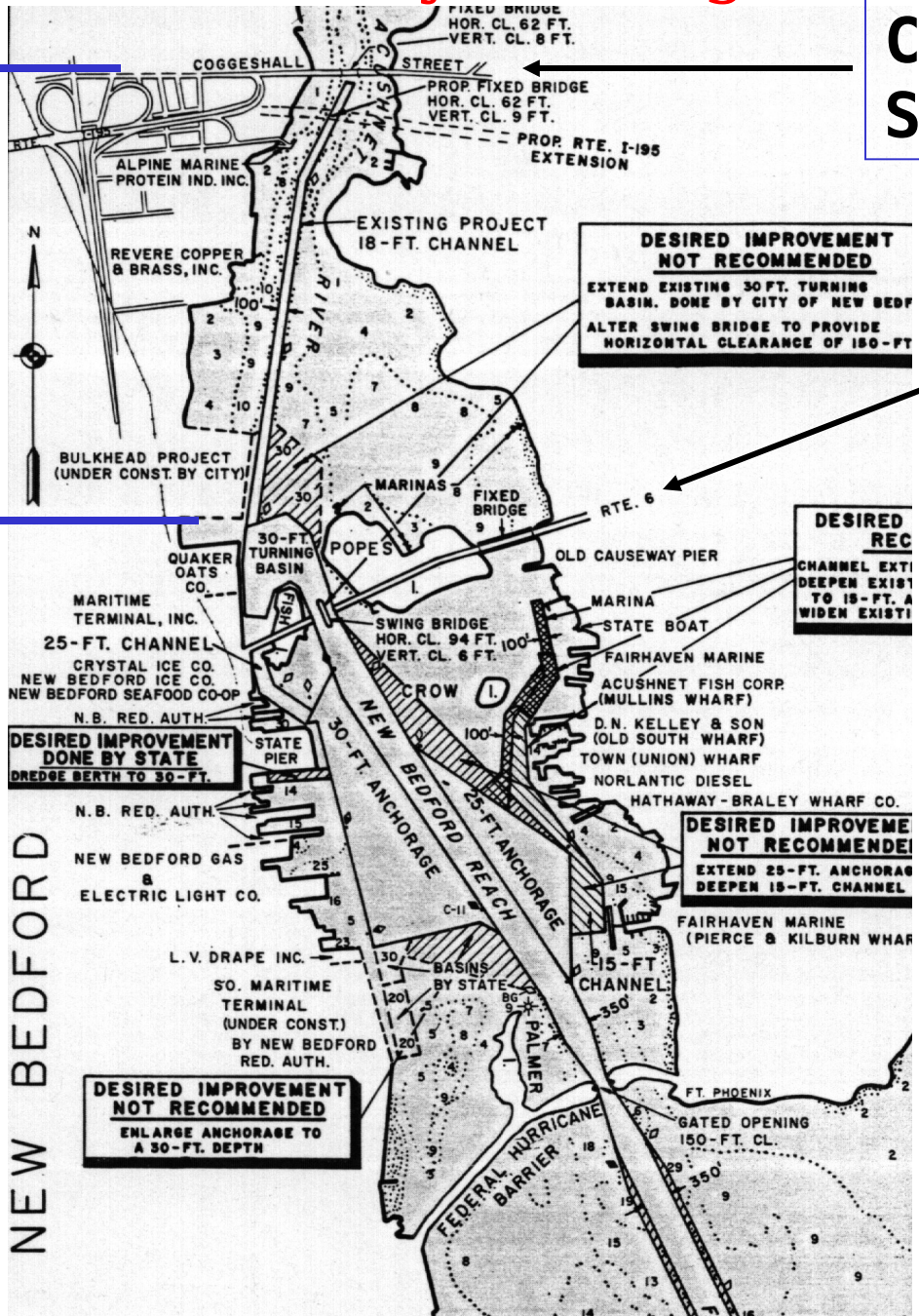
History - Navigation

Dredged by State/ Town

Federal Channel

Coggeshall St. Bridge

Route 6 Bridge


COGGESHALL STREET
FIXED BRIDGE HOR. CL. 62 FT. VERT. CL. 8 FT.
PROP. FIXED BRIDGE HOR. CL. 62 FT. VERT. CL. 9 FT.
PROP. RTE. I-195 EXTENSION
ALPINE MARINE PROTEIN IND. INC.
REVERE COPPER & BRASS, INC.
EXISTING PROJECT 18-FT. CHANNEL
RIVER
DESIRED IMPROVEMENT NOT RECOMMENDED
EXTEND EXISTING 30 FT. TURNING BASIN. DONE BY CITY OF NEW BEDF
ALTER SWING BRIDGE TO PROVIDE HORIZONTAL CLEARANCE OF 150-FT
BULKHEAD PROJECT (UNDER CONST. BY CITY)
MARINAS
FIXED BRIDGE
RTE. 6
30-FT. TURNING BASIN
POPES I.
QUAKER OATS CO.
OLD CAUSEWAY PIER
MARITIME TERMINAL, INC.
25-FT. CHANNEL
SWING BRIDGE HOR. CL. 94 FT. VERT. CL. 6 FT.
MARINA
STATE BOAT
FAIRHAVEN MARINE
CROW I.
ACUSHNET FISH CORP. (MULLINS WHARF)
CRYSTAL ICE CO.
NEW BEDFORD ICE CO.
NEW BEDFORD SEAFOOD CO-OP
N.B. RED. AUTH.
D.N. KELLEY & SON (OLD SOUTH WHARF)
TOWN (UNION) WHARF
NORLANTIC DIESEL
HATHAWAY-BRALEY WHARF CO.
DESIRED IMPROVEMENT DONE BY STATE
DREDGE BERTH TO 30-FT.
STATE PIER
30-FT. ANCHORAGE
NEW BEDFORD REACH
25-FT. ANCHORAGE
DESIRED IMPROVEME NOT RECOMMENDE
EXTEND 25-FT. ANCHORAG DEEPEN 15-FT. CHANNEL
N.B. RED. AUTH.
NEW BEDFORD GAS & ELECTRIC LIGHT CO.
FAIRHAVEN MARINE (PIERCE & KILBURN WHAR
L.V. DRAPE INC.
SO. MARITIME TERMINAL (UNDER CONST.) BY NEW BEDFORD RED. AUTH.
BASINS BY STATE
15-FT. CHANNEL
PALMER
DESIRED IMPROVEMENT NOT RECOMMENDED
ENLARGE ANCHORAGE TO A 30-FT. DEPTH
FT. PHOENIX
GATED OPENING 150-FT. CL.
FEDERAL HURRICANE BARRIER
NEW BEDFORD

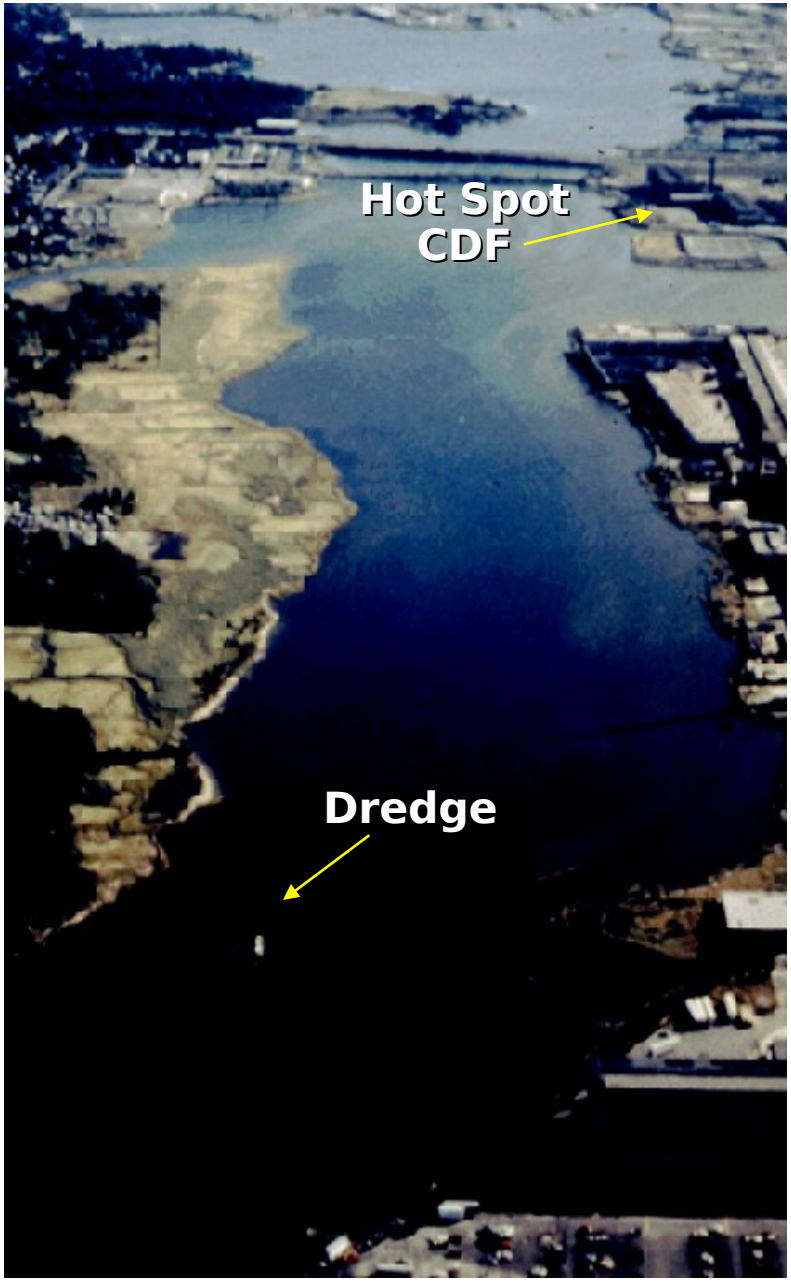
History - Navigation

- 1839 First Corps Navigation Dredging
- Federal Channel to the Turning Basin just above the Route 6 Bridge
- 1912 Federal Project Authorized North of Turning Basin
- 1920 State Dredged this Channel.
- 1970 Proposed Navigation Improvements
- 1971 Environmental Assessment Report: Sediment Tested per Federal Water Quality Administration Guidelines (EPA precursor)
- 1983 North Channel De-authorized

History - Superfund

- 1970s PCBs detected in sediment & seafood
- Fishing Bans
- 1983 - Superfund Status
- Since Mid-1980s - Corps support to EPA
- 1990 ROD addressed “Hot Spot” [5 acres]
  - Targeted sediment > 4,000 ppm PCBs in UH
  - Dredged ~14,000 CY 1994-1995
  - 4,000 ppm to 100,000+ ppm PCBs
  - Temporarily stored in upland lined cell; plan to incinerate halted due to shift in public support
- ROD Revised in 1999 - Transported and Disposed (T & D) at Offsite TSCA Facility

History - Superfund - Hot Spot Cleanup



History - Superfund - Hot Spot Cleanup

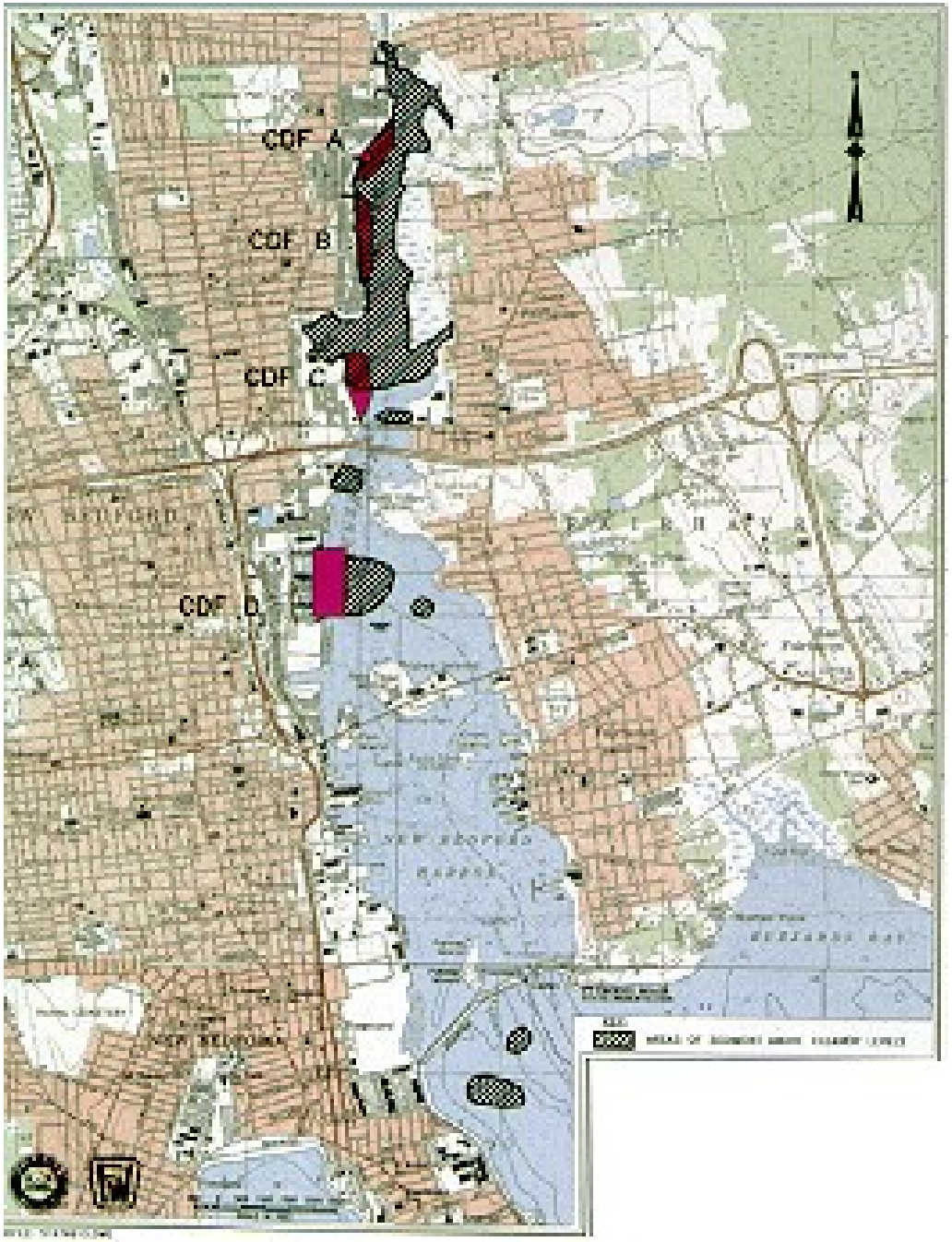
History - Superfund

- 1998 ROD to address entire rest of harbor
- Cleanup Levels:
  - 10 ppm Upper Harbor
  - 50 ppm Lower Harbor
  - Intertidal Sediments
    - 1 ppm Residential
    - 25 ppm Beachcombing
- Cleanup Goals:
  - Reduce health risks from seafood consumption.
  - Reduce health risks from contact w/ sediment.
  - Improve water quality of the harbor's highly distressed marine ecosystem.

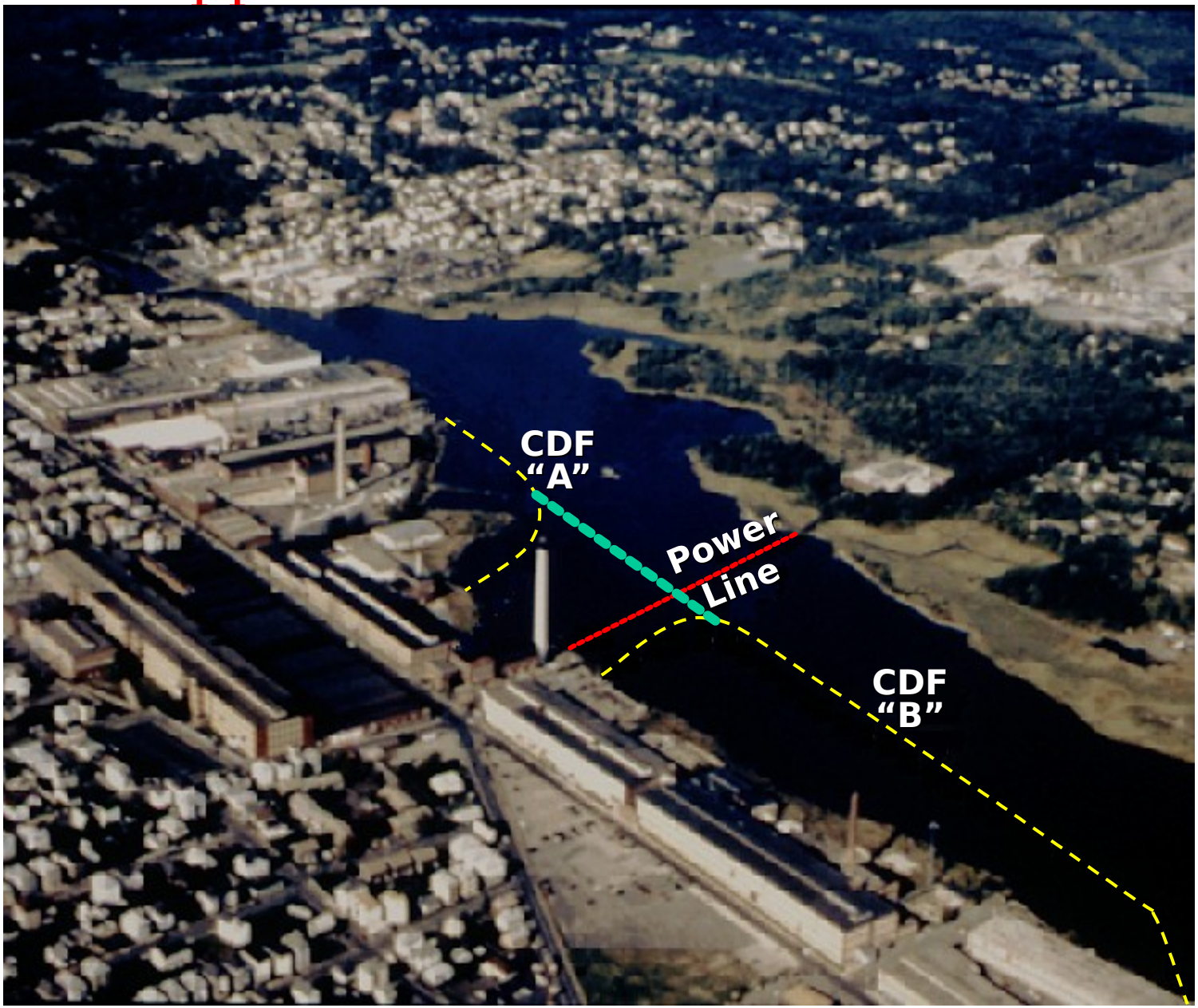
Remedy Paradigms - CDFs

- 1998 ROD: Dredge sediment, place in Confined Disposal Facilities along shore.
  - CDFs protective of the environment
  - T & D screened out early due to cost
  - 450,000 CY (in-situ)
  - Place as slurry in CDFs (BF = 1.4)
  - CDFs (4) sized accordingly
  - **CDF D**: Corps Design, Largest (20 acres), LH
  - D: Underlain by dense till
  - D: Cellular bulkhead
  - D: Layout need not consider channel
  - Town to build port facility over CDF D

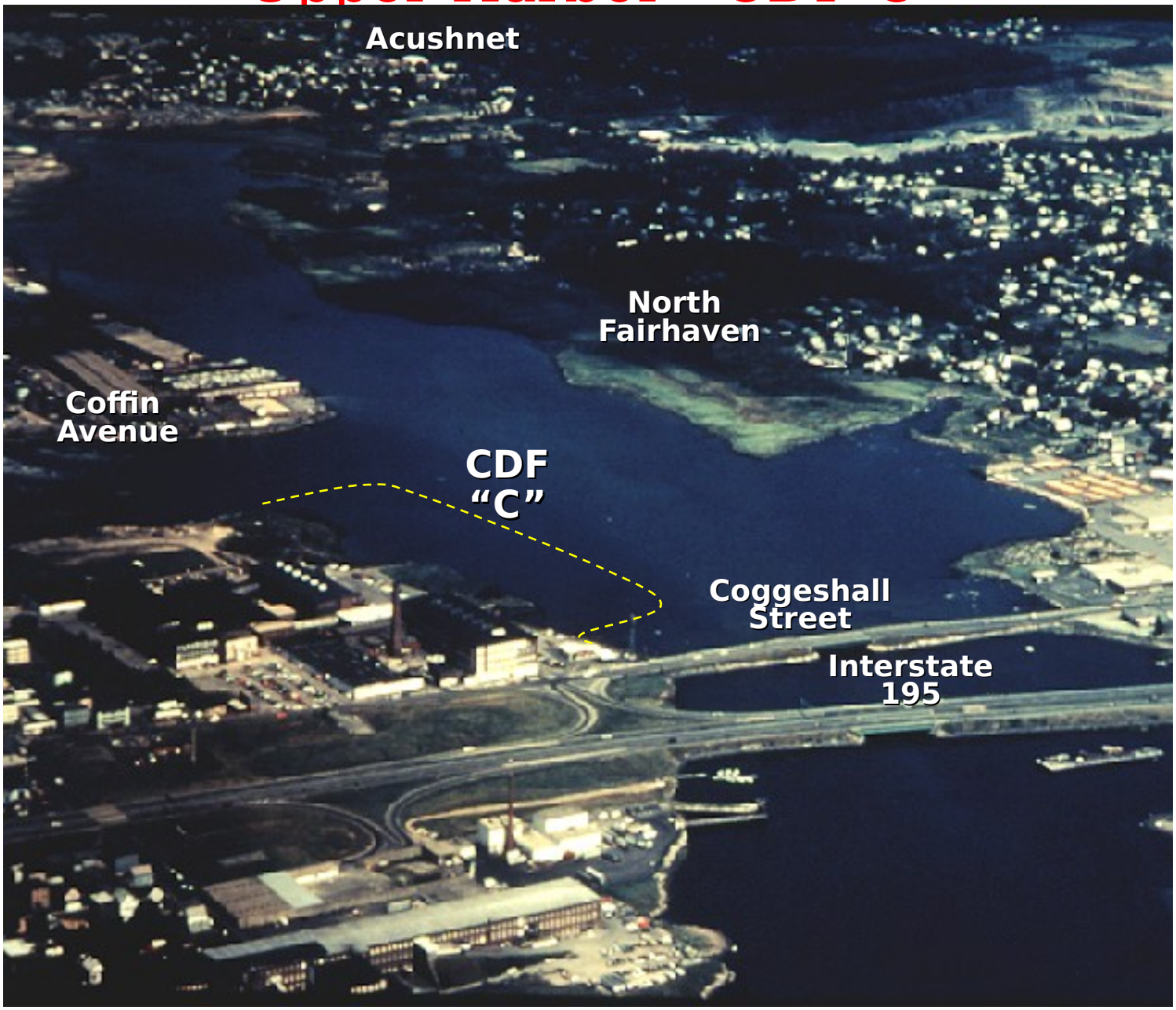
New Bedford Harbor - CDFs



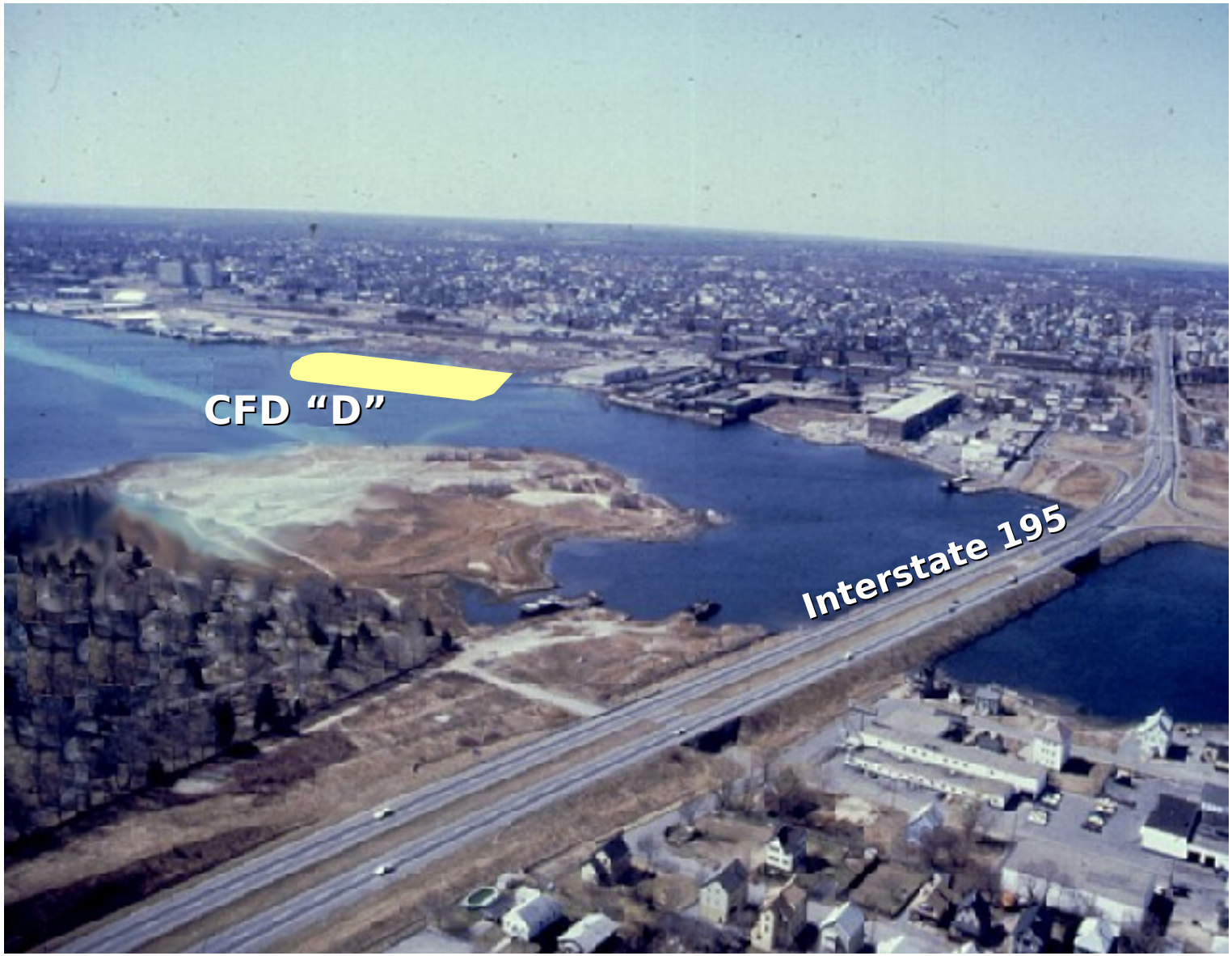
Upper Harbor - CDFs A and B



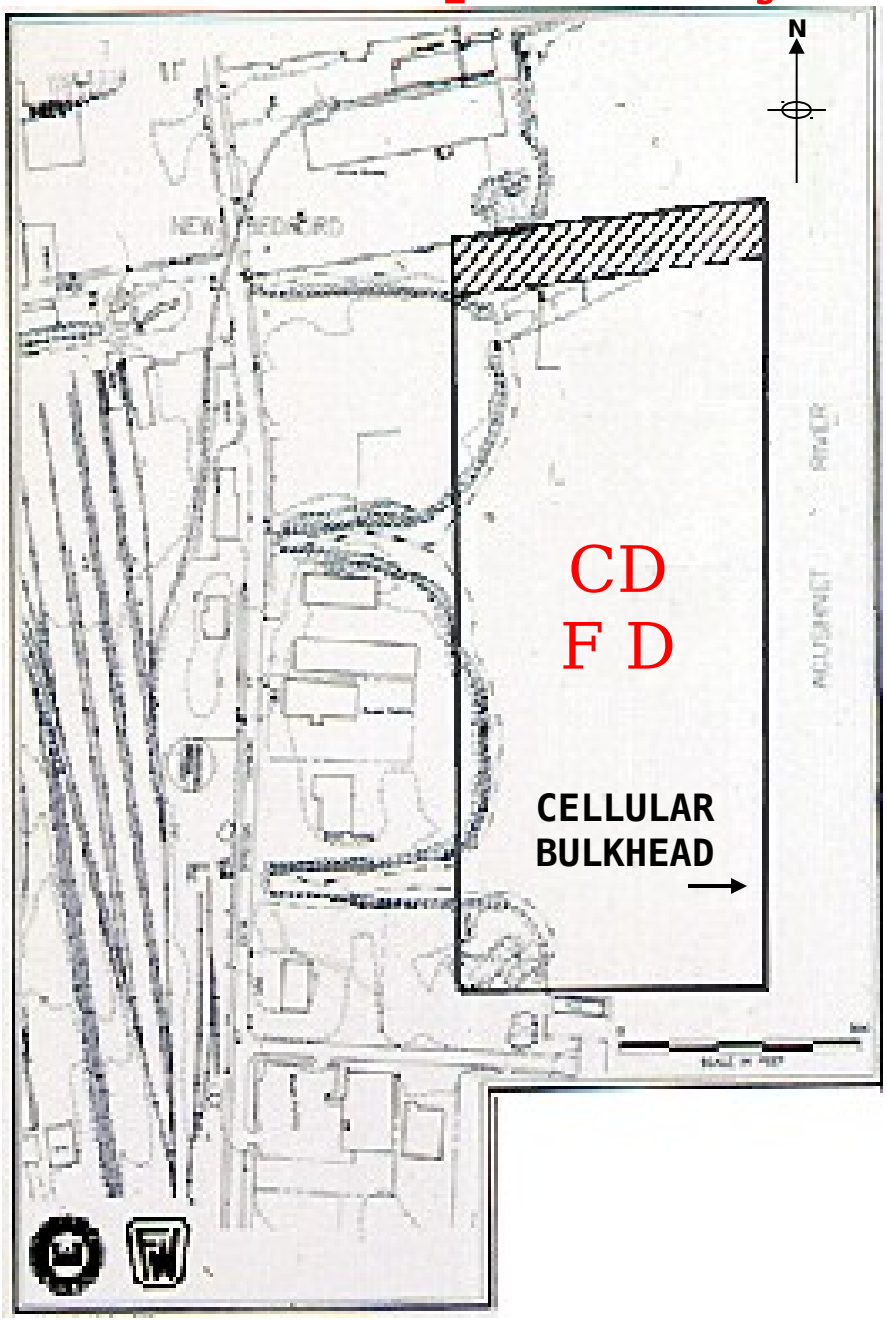
Upper Harbor - CDF C



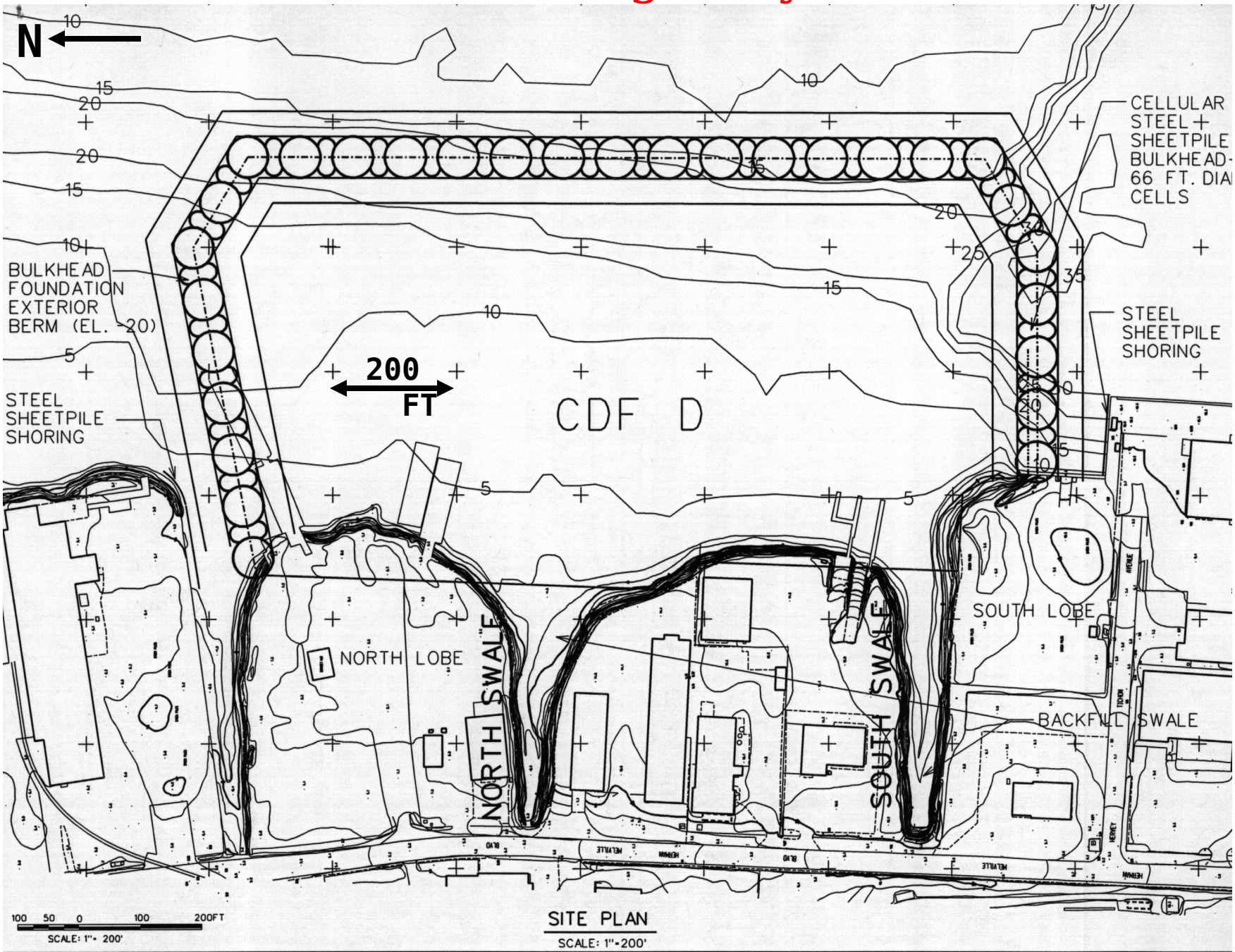
Lower Harbor - CDF D



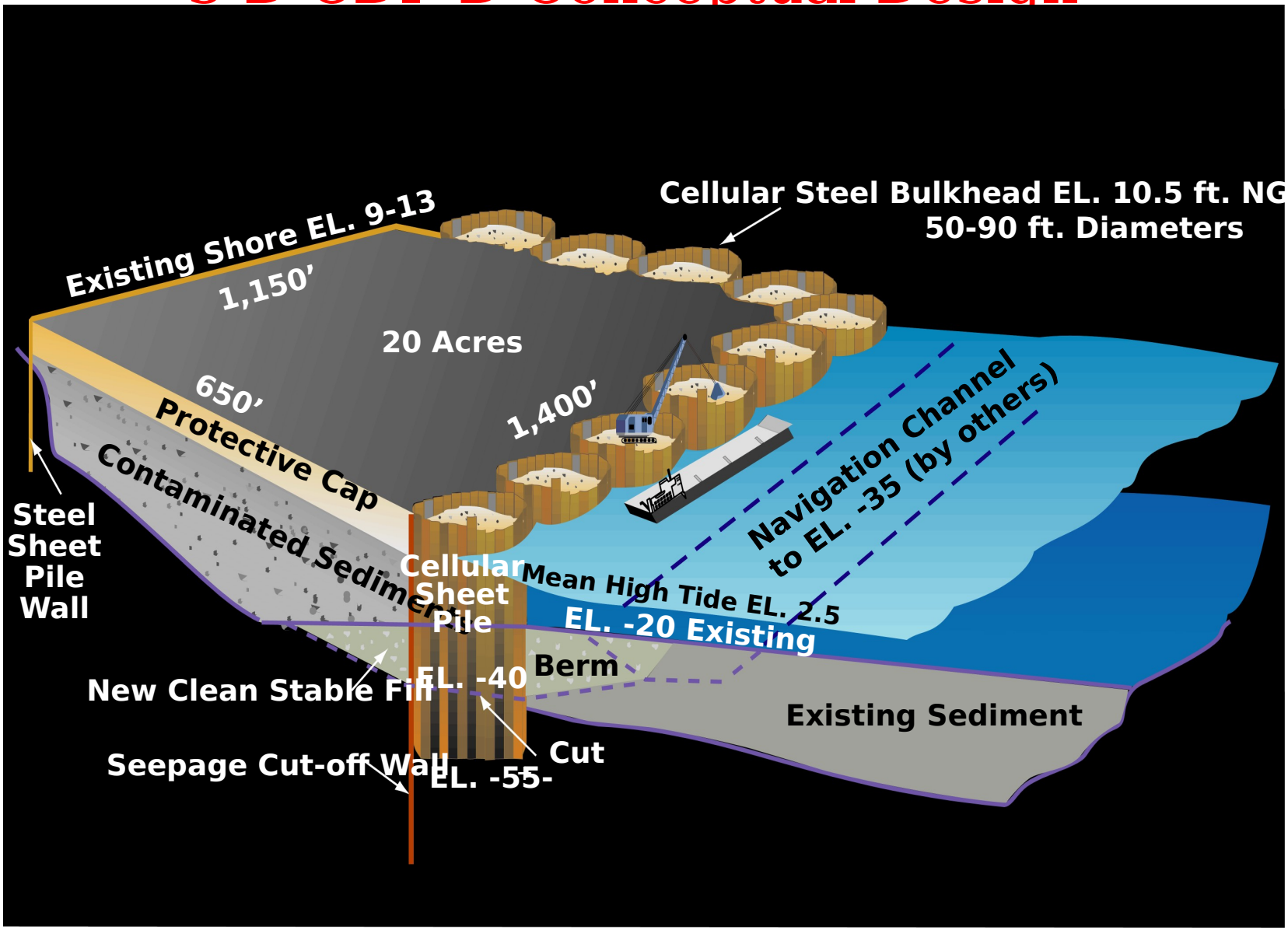
CDF D Conceptual Layout



CDF D Design Layout



3-D CDF D Conceptual Design

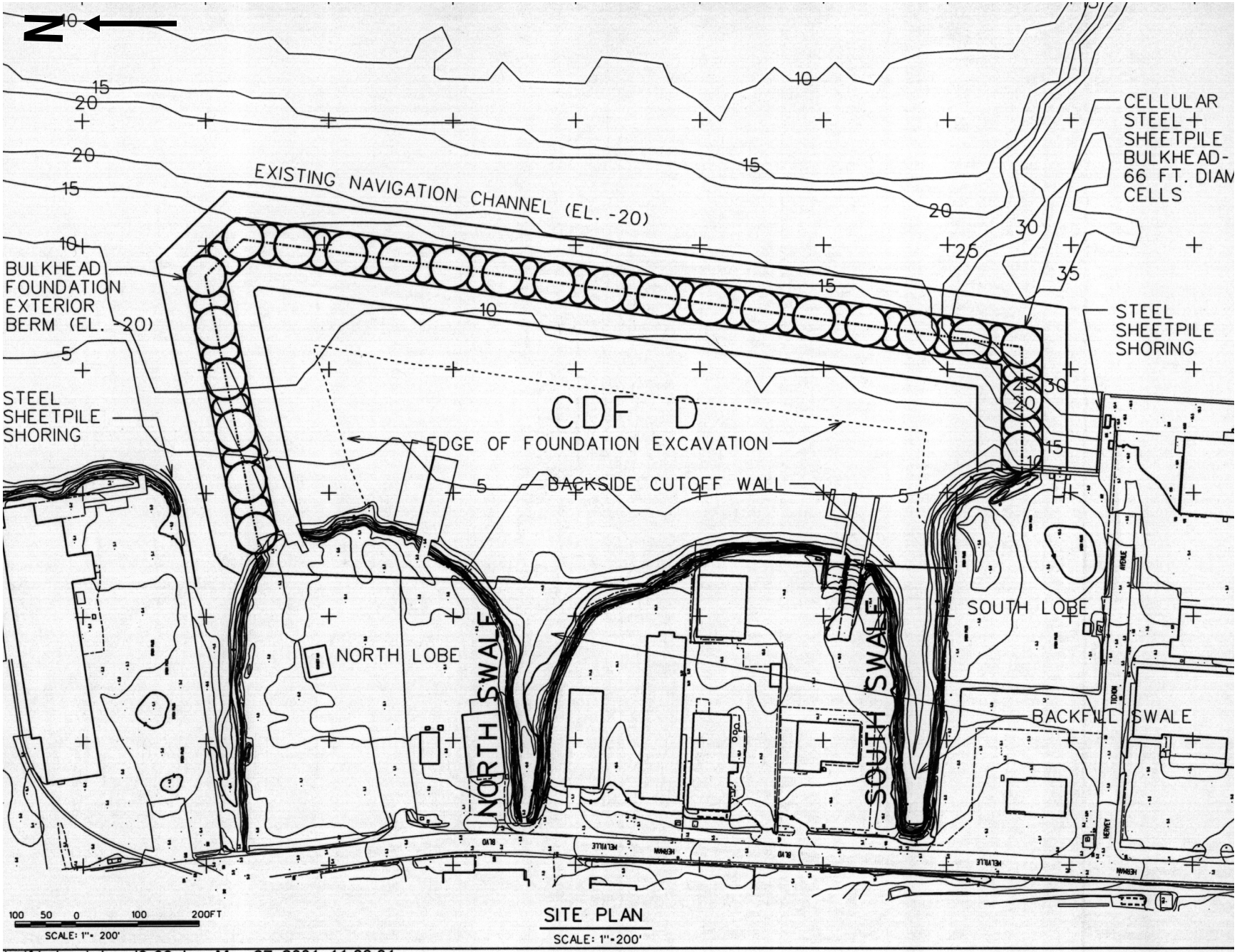


CDF Design - Paradigm Shifts

- 1999 Geotechnical Explorations at CDF D:
  - Till is deeper, looser, and more variable than anticipated.
  - Loose (weak) estuary and glaciofluvial deposits thicker than anticipated.
  - Removal of weak foundation material required; more cost effective than improving it in place.
  - Attractive (politically) to move CDF D alignment towards land (out of channel).

- 1999 Delineation Sampling: Volume of contaminated sediment increased from 450,000 CY to 832,000+ CY.

CDF Design - New Alignment CDF D



CDF Design - Paradigm Shifts - Effects

- Material Handling Issues: Volume of weak foundation material at CDF D requiring removal: ~300,000 CY
- New alignment reduces storage capacity.
- Capacity requirements have increased 85%.

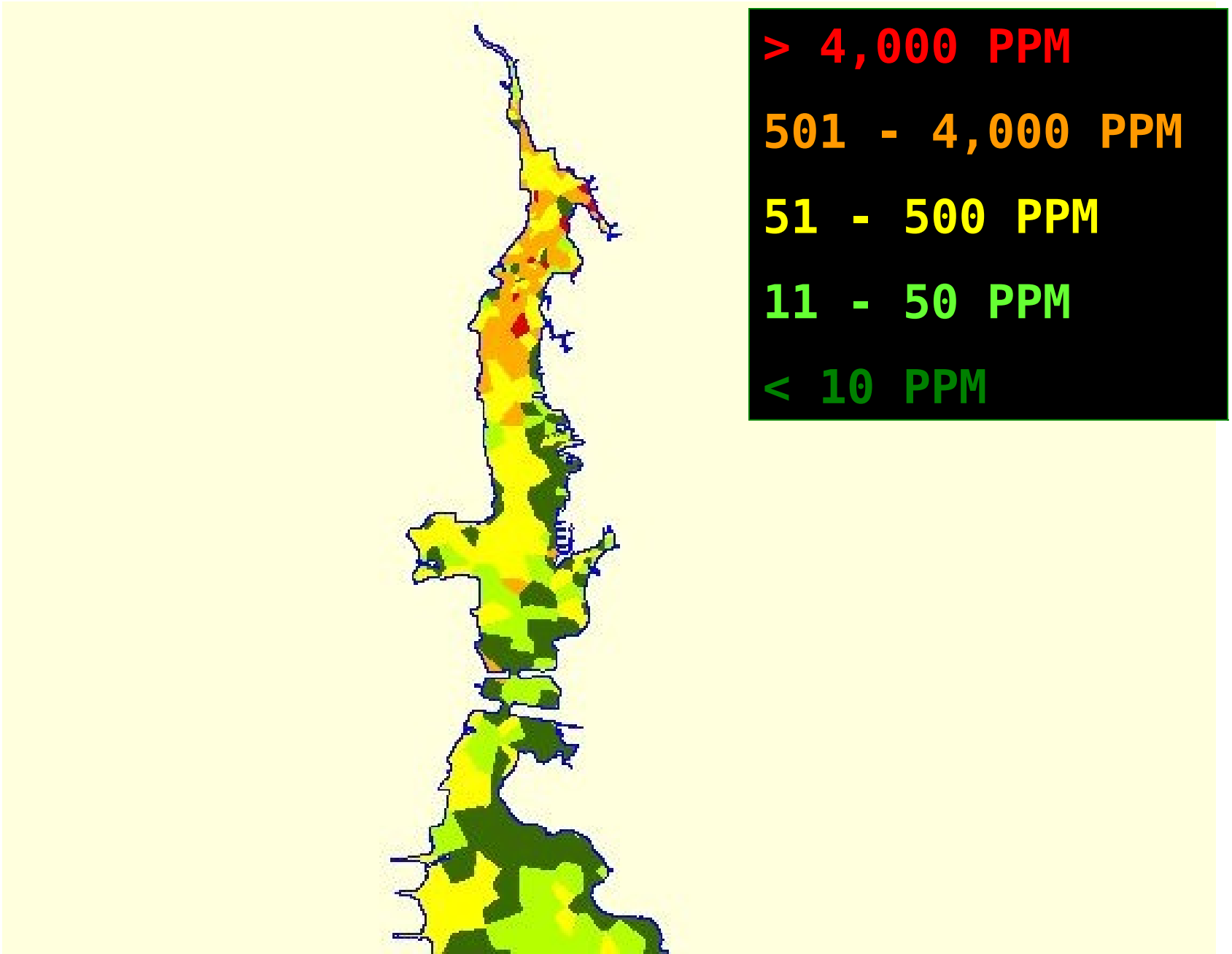
- Add mechanical dewatering to reduce volume of dredged sediment (“BF” = 0.5)
- Increased Costs

- 30% Design → Alternatives Analysis

Dredging Design Paradigms

- Dredging accuracies of < 1 ft not practical
- Dredging plans will show 1-ft cuts
- No need to sample at intervals < 1 ft
- Vertical delineation samples collected over 1-ft intervals, without consideration of material type

Dredging Design - PCBs 0 - 1 Ft



Dredging Design - Paradigm Shifts & Effect

- Specialized dredging equipment now available; “surgical dredging” (3-inch accuracy) now possible.
- Recent detailed sampling indicates almost all PCBs are in uppermost black silty sediment.
- Pre-Design Field Test indicates dredge operator may be able to differentiate between materials visually (Aug. 2000).

- **Effect:** Exploring possibility of using a visual approach to guide dredging.

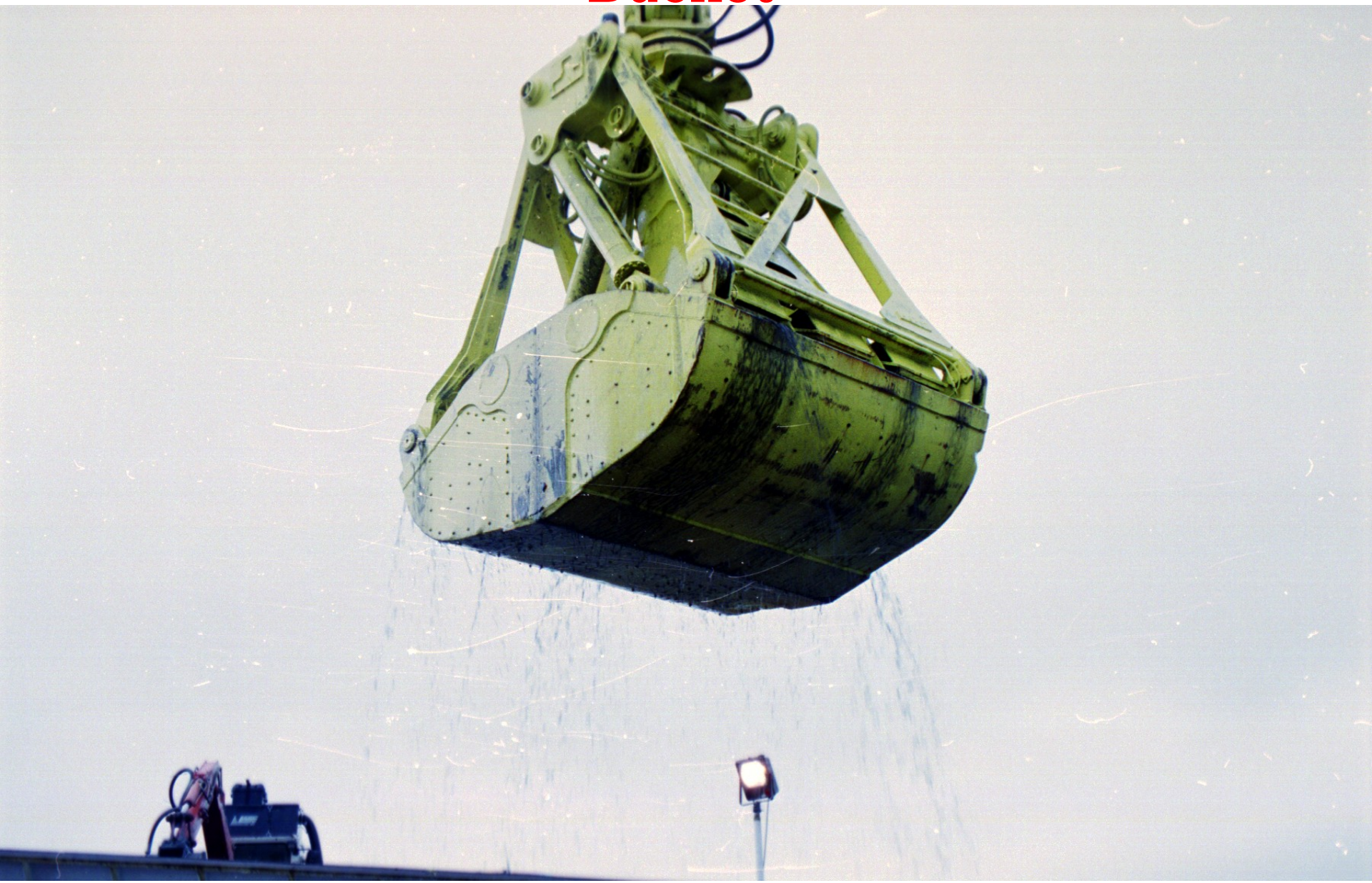
Pre-Design Field Test - Aerial View

Pre-Design Field Test

Pre-Design Field Test - Environmental Bucket

Pre-Design Field Test - Environmental Bucket

Pre-Design Field Test - Environmental Bucket



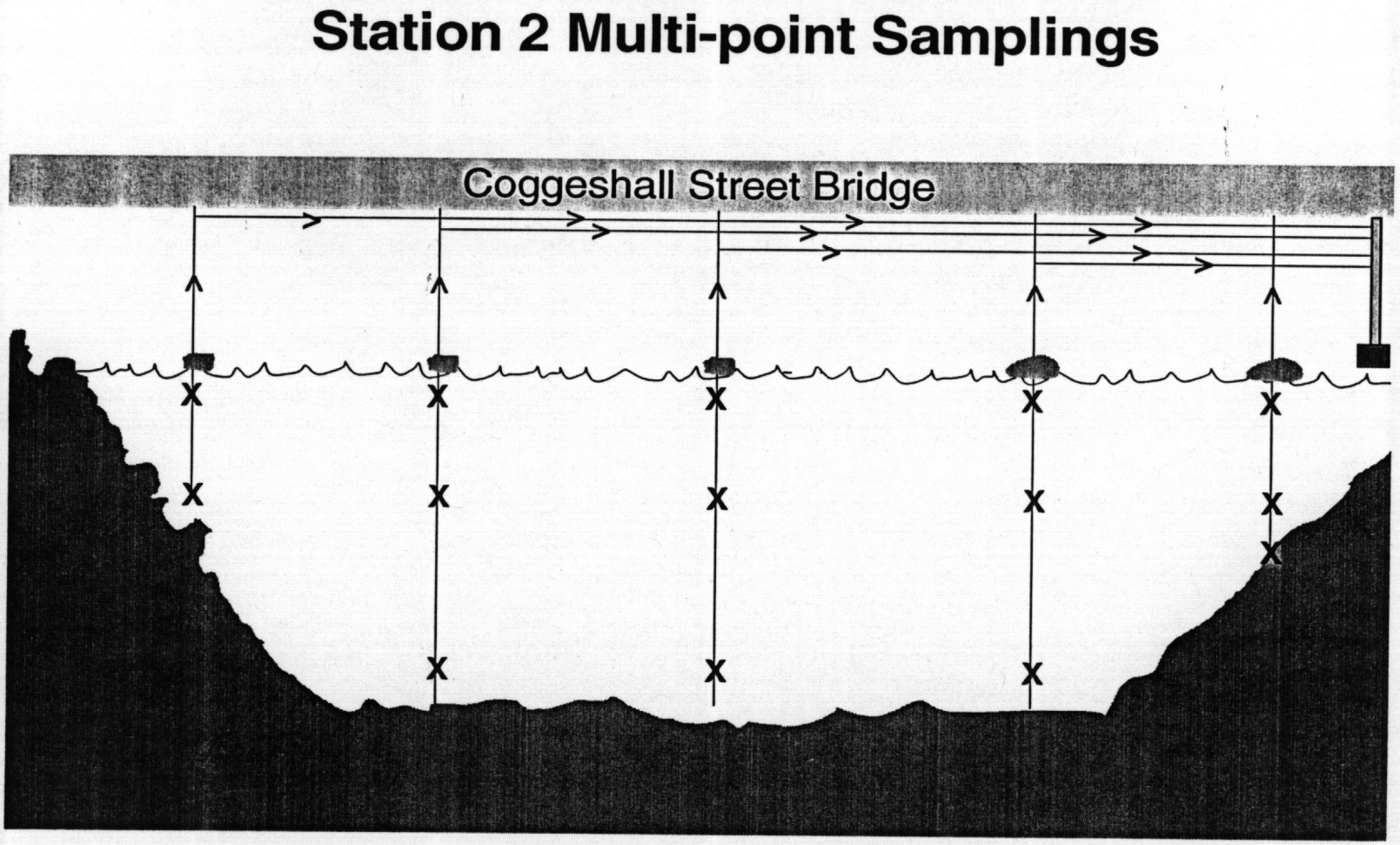
Habitat Restoration

- ROD calls for 1:1 replacement of habitats destroyed due to dredging and excavation.
- New Bedford Harbor Trustee Council:
  - Mass Executive Office of Environmental Affairs
  - DOC - NOAA
  - DOI - Fish & Wildlife
- Trustees are overseeing additional natural resource restoration projects ($10M)

Environmental Monitoring

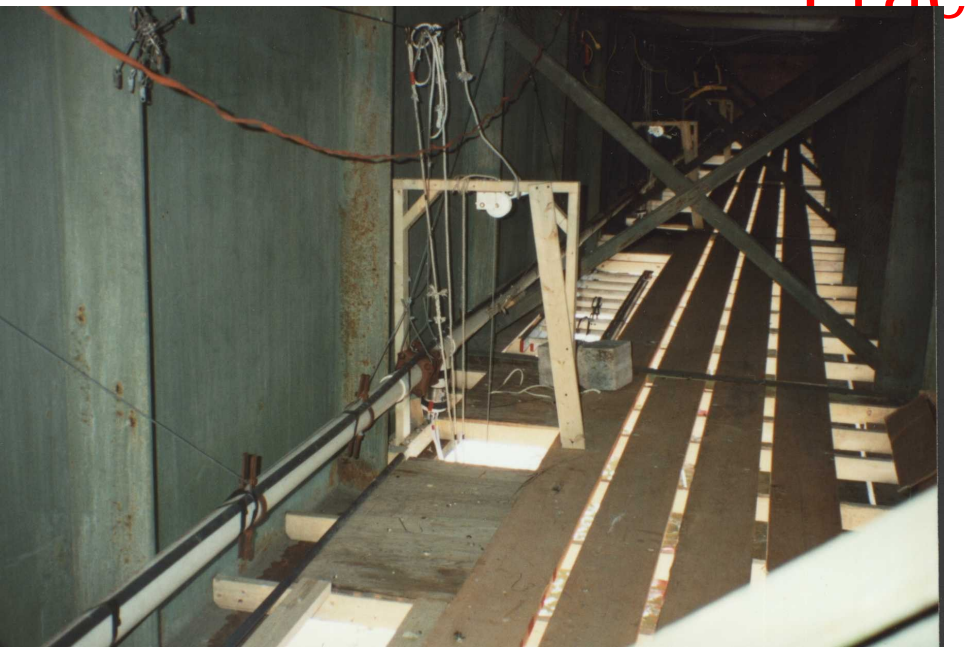
- During Operations
  - air & water quality
  - avoid spreading contamination
  - isolate impacts
  - How: Measure flux of PCBs from Upper Harbor to Lower Harbor (under Coggeshall St. Bridge).
- Confirmatory Sampling
  - verify ROD levels reached
- Long Term Monitoring
  - assess effect of cleanup

Environmental Monitoring - Theory



Environmental Monitoring - Practice

Environmental Monitoring - Better Practice



Environmental Monitoring - Long Term

- Long Term Monitoring Objective: To assess ecosystem recovery as a result of remediation. (“the report card”)
- Water quality, seafood, sediment.
- Currently:
  - Ambient water exceeds water quality standards.
  - PCBs in sediment act as a continuing source.
  - Ecosystem
    - stressed
    - lacks diversity
    - dominated by opportunistic stress-adaptive species.

What could we have done differently?

- Recognize inherent uncertainty when going from Conceptual Design to Final Design.
- Early sensitivity analyses? Geostatistics?
  - Estimated dredging volumes.
  - Foundation geotechnical design parameters
- Question Paradigms. Predict Future.

- While sediment volume has increased by **85%**, costs have increased only **22%,** thanks to innovations related to dredging technologies and water treatment.

Amphipod

We are no stronger than our weakest member.

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